

REMARKS

Claims 32, 34, 36-45, 47-49, and 51-55 are currently pending in the instant application. By way of the present response, Applicants have amended claims 32, 36, 37, 42, and 47-49. Claims 46 and 50 have been cancelled. New claims 51-55 have been added. No new matter has been added. Applicants respectfully request reconsideration of the present application and the allowance of all claims now presented.

35 U.S.C. § 102 Rejections

The Examiner has rejected claims 32, 37, 41 and 48 under 35 U.S.C. § 102(b) as being anticipated by EP 0905747. In light of the amendment, the Examiner's rejections have become moot. Nonetheless, the following remarks regarding the Examiner's rejections and the amended claims may be helpful to expedite prosecution.

Claim 32 relates to a method of cleaning a wafer comprising: exposing the frontside of a spinning wafer to an etchant or cleaning chemicals; after exposing said wafer to said etchant or cleaning chemical applying on said frontside of said spinning wafer a **volume of liquid** having a **lower surface tension** than water; and **after** applying the volume of liquid having a lower surface tension than water, applying onto the frontside of said wafer a **volume of liquid water**, which has been Delonized (DI), wherein the volume of liquid having a lower surface tension than water and the volume of liquid DI water are **uncombined and each applied separately** to the frontside of the wafer.

In contrast, EP 0905747 fails to disclose or suggest applying a **volume of liquid** having a **lower surface tension** than water; and **after** applying the **volume of liquid** having a **lower surface tension** than water, applying a **volume of liquid DI water**, wherein the liquid having a lower surface tension than water and the liquid DI water are **uncombined and each applied separately** to the frontside of the wafer. EP 0905747 discloses **simultaneously** applying a rinse liquid and a gas that lowers the surface tension of the liquid/gas combination. EP 0905747 fails to recognize the advantages of first applying a liquid having a lower surface tension, and then a DI water rinse, **uncombined and applied separately**.

Chemical removal from a wafer involves a combination of both convection and diffusion. However, only diffusion is a factor in the region close to the surface of the wafer. The rate of diffusion on chemicals is a function of the thickness of the boundary layer near the surface, see paragraph [0013] in the specifications. In order to save on the costs associated in both material costs and disposal costs of low surface tension liquids, such as IPA, and to a much lesser extent DI water, the methods to clean wafers need to reduce the usage of IPA, while still providing clean wafer surfaces. Applying IPA only initially is effective in diffusing the chemicals from the surface and then flushing the diffused chemicals later with DI water. This is an effective method of dramatically reducing the use of expensive IPA. Further, this method also reduces the time required to achieve comparable cleans. EP 0905747 fails to recognize these advantages and applies IPA continuously together with water, which requires much larger quantities of IPA to achieve the same clean and requires more time.

In addition, EP 0905747 teaches away from claim 32, as well as the other independent claims, claims 37 and 42, by specifically disclosing and advocating the step of “supplying a surface tension reducing gaseous substance **together with** the

liquid." See column 4, lines 40-45. Also EP 0905747 discloses that after the combined gas and liquid clean, the wafer is "cleaned and dried," and removed from the apparatus, col.3, lines 56-57, suggesting no further rinsing with DI water.

Applicant would like to point out that according to Webster's II, New College Dictionary, 1995, **surface tension** is defined to be "a property of liquids arising from unbalanced molecular cohesive forces at or near the surface, as a result of which the surface tends to contract and has properties resembling those of a stretched elastic membrane." Therefore, it is meaningless to suggest that a **gas or vapor** has a surface tension. Reference in the art to the surface tension of a gas or vapor is merely a short-handed means of discussing the surface tension of the liquid used to produce the gas or vapor, and is not meant to suggest that the gas or vapor actually has a surface tension. The claims were amended to more particularly point out and distinctly claim the invention.

In view of the above remarks, a specific discussion of the dependent claims is considered to be unnecessary. Therefore, Applicants' silence regarding any dependent claim is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim. Nonetheless, the following remarks regarding the Examiner's rejections and the amended claims may be helpful to expedite prosecution.

EP 0905747 fails to disclose or suggest **blowing a fluid**, such as nitrogen, etc., at the center of the wafer while the wafer is spinning to remove a **DI water bulge** formed at the center of the wafer. EP 0905747 fails to recognize that DI water will bulge at the center of a spinning wafer due to reduced centripetal forces at the center, thus requiring an additional mechanism to address this problem.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 32, 37, 41 and 48 under 35 U.S.C. § 102(b) as being anticipated by EP 0905747.

The Examiner has rejected claims 32, 37, 41, 47 and 48 under 35 U.S.C. § 102(e) as being anticipated by Mertens et al., US Patent No. 6,491,764, ("Mertens").

In light of the amendment, the Examiner's rejections have become moot. Nonetheless, the following remarks regarding the Examiner's rejections and the amended claims may be helpful to expedite prosecution.

In view of the above remarks and given that Mertens and EP 0905747 appear to be very closely related references, Mertens also fails to remedy the deficiencies of EP 0905747. In view of the above remarks, a specific discussion of the dependent claims is considered to be unnecessary. Therefore, Applicants' silence regarding any dependent claim is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 32, 37, 41, 47 and 48 under 35 U.S.C. § 102(e) as being anticipated by Mertens.

The Examiner has rejected claims 32, 34, 36-38, 40-44 and 46-50 under 35 U.S.C. § 102(e) as being anticipated by Lorimer, US Patent No. 6,460,552 ("Lorimer").

In light of the amendment, the Examiner's rejections have become moot. Nonetheless, the following remarks regarding the Examiner's rejections and the amended claims may be helpful to expedite prosecution.

Lorimer also fails to disclose or suggest first applying a liquid having a lower surface tension, and then a DI water rinse, **uncombined and applied separately**. In fact, Lorimer teaches away from the use of liquid DI water and applies the low

surface tension vapor and water vapor combined as a single steam rinse. See col.7.

Further in col. 12, Lorimer appears to disclose the removal of a clean and dry wafer after the combined vapors application, without the subsequent liquid DI water rinse.

In view of the above remarks, a specific discussion of the dependent claims is considered to be unnecessary. Therefore, Applicants' silence regarding any dependent claim is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim. Nonetheless, the following remarks regarding the Examiner's rejections and the amended claims may be helpful to expedite prosecution.

A mere nitrogen purge would not appear to be an effective means of removing a DI water bulge from a spinning wafer.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 32, 34, 36-38, 40-44 and 46-50 under 35 U.S.C. § 102(e) as being anticipated by Lorimer.

35 U.S.C. § 103 Rejections

The Examiner has alternatively rejected claims 39 and 45 under 35 U.S.C. § 103(a) as being unpatentable over Lorimer in view of Chang et al., U.S. Patent No. 6,273,099 ("Chang"). In light of the amendment, the Examiner's rejections have become moot. Nonetheless, the following remarks regarding the Examiner's rejections and the amended claims may be helpful to expedite prosecution.

Chang discloses an immersion rinse with heated DI water for batch processing, followed by three or more rinses. Chang fails to disclose or suggest a single wafer process, nor the steps of applying a chemical, followed by a surface tension lowering fluid, and then a

separate DI rinse. Therefore, Chang fails to remedy the deficiencies of Lorimer, Mertens, and EP 0905747.

Chang is introduced to disclose the use of heated DI water. However, it is unclear why a skilled artisan would combine Chang specifically with the prior art of record to produce the claimed invention. The art associated with batch processing is not necessarily analogous to single wafer processing. Chang discloses three or more rinses, which is very time consuming and would render the combination impractical in a single wafer process.

In view of the above remarks, a specific discussion of the dependent claims is considered to be unnecessary. Therefore, Applicants' silence regarding any dependent claim is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 39 and 45 under 35 U.S.C. § 103(a) as being unpatentable over Lorimer in view of Chang.

The Examiner has rejected claims 38 and 39 under 35 U.S.C. § 103(a) as being unpatentable over any one of Mertens or EP 0905747 in view of Chang. In view of the above remarks, a specific discussion of the dependent claims is considered to be unnecessary. Therefore, Applicants' silence regarding any dependent claim is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 38 and 39 under 35 U.S.C. § 103(a) as being unpatentable over any one of Mertens or EP 0905747 in view of Chang.

CONCLUSION

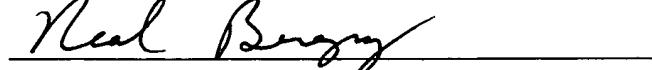
Applicant respectfully submits that the present application is in condition for allowance. If the Examiner believes a telephone conference would expedite or assist in the allowance of the present application, the Examiner is invited to call Neal Berezny at (408) 962-7563 or Michael A. Bernadicou at (408) 720-8300.

Pursuant to 37 C.F.R. 1.136(a)(3), applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

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Neal Berezny
Reg. No. 56,030

Patent Counsel
Legal Affairs Dept.
Applied Materials, Inc.
P. O. Box 450A
Santa Clara, CA 95052

Direct telephone calls to:
Michael A. Bernadicou
(408) 720-8300

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